



KNOWLEDGE AND EMPLOYABILITY MATHEMATICS 8–9

Policy: Knowledge and Employability courses provide students who meet the criteria with opportunities to experience success and become well-prepared for employment, further studies, citizenship and lifelong learning (*Knowledge and Employability Courses Policy 1.4.2*).

VISION

Through Knowledge and Employability courses, students become active, responsible citizens, achieve their educational and career goals, improve the quality of life for themselves and their families, and positively impact their communities.

PHILOSOPHY AND RATIONALE

The development of a distinctive sequence of courses such as Knowledge and Employability is based on input about the needs of learners gathered from consultations with education stakeholders throughout the province.

To meet the educational needs of students, Knowledge and Employability courses are designed for the student who learns best:

- when meaningful connections are made between schooling and personal experiences.

Knowledge and Employability courses assist students to make the transition from school to the workplace and community, prepare for responsible citizenship, and be recognized, respected and valued by employers and further education providers. The skills, abilities and work effort that Knowledge and Employability courses promote include:

- academic and occupational skills of a standard determined by the workplace to be necessary for success
- practical applications through on- and off-campus experiences and/or community partnerships
- career development skills to explore careers, develop a career-focused portfolio and assess career skills
- interpersonal skills to ensure respect, support and cooperation with others.

• when the focus is on the development and application of reading, writing and mathematical literacy,¹ and essential employability skills

with experiential learning activities

QA

14

C22

A3

A333

2005

gr.08-09

CURR GD

HIST

Mathematical literacy: Selecting and applying appropriate mathematical operations, problem-solving strategies, tools and technology, and communicating using mathematical vocabulary in home, workplace and community experiences.

Knowledge and Employability
Education, Alberta, Canada

Mathematics 8–9 /1
(2005 Draft)



Digitized by the Internet Archive
in 2012 with funding from
University of Alberta Libraries

<http://archive.org/details/knowemploymath8905albe>

KNOWLEDGE AND EMPLOYABILITY MATHEMATICS 8–9

Policy: Knowledge and Employability courses provide students who meet the criteria with opportunities to experience success and become well-prepared for employment, further studies, citizenship and lifelong learning (*Knowledge and Employability Courses Policy 1.4.2*).

VISION

Through Knowledge and Employability courses, students become active, responsible citizens, achieve their educational and career goals, improve the quality of life for themselves and their families, and positively impact their communities.

PHILOSOPHY AND RATIONALE

The development of a distinctive sequence of courses such as Knowledge and Employability is based on input about the needs of learners gathered from consultations with education stakeholders throughout the province.

To meet the educational needs of students, Knowledge and Employability courses are designed for the student who learns best:

- when the focus is on the development and application of reading, writing and mathematical literacy,¹ and essential employability skills
- through experiential learning activities

- when meaningful connections are made between schooling and personal experiences.

Knowledge and Employability courses assist students to make the transition from school to the workplace and community, prepare for responsible citizenship, and be recognized, respected and valued by employers and further education providers. The skills, abilities and work effort that Knowledge and Employability courses promote include:

- academic and occupational skills of a standard determined by the workplace to be necessary for success
- practical applications through on- and off-campus experiences and/or community partnerships
- career development skills to explore careers, develop a career-focused portfolio and assess career skills
- interpersonal skills to ensure respect, support and cooperation with others.

1. *Mathematical literacy: Selecting and applying appropriate mathematical operations, problem-solving strategies, tools and technology, and communicating using mathematical vocabulary in home, workplace and community experiences.*

Aboriginal Perspectives and Experiences

For historical, constitutional and social reasons, an understanding of First Nations, Métis and Inuit (FNMI) experiences and perspectives, and recognition that First Nations, Métis and Inuit students have particular needs and requirements is necessary to enable all students to be respectful and responsible citizens.

Knowledge and Employability courses serve to facilitate positive experiences that will help Aboriginal students better see themselves in the curriculum and assist non-Aboriginal students to develop a better understanding of Alberta's First Nations, Métis and Inuit peoples.

GOALS OF KNOWLEDGE AND EMPLOYABILITY COURSES

Knowledge and Employability courses provide students with practical and applied opportunities to develop competencies necessary to meet or exceed the following goals:

- earn a senior high school credential
- enter the workplace upon leaving school with employability and occupational skills that meet industry standards
- make successful transitions to other courses or to further education and training
- become responsible and contributing members of society.

CROSS-CURRICULAR COMMUNITY AND WORKPLACE CONNECTIONS

Programs of study and resources for Knowledge and Employability courses are distinctive, in part, because they promote cross-curricular, community and workplace connections.

Cross-curricular Connections

Knowledge and Employability courses promote the integration of subjects to emphasize their interrelationships and connections to other school subjects. The philosophy of Knowledge and Employability courses is that students learn best when they can clearly recognize connections, applications and relevance to a variety of everyday experiences. Organizing for

instruction may include thematic units, subject integration within units and/or projects in other subjects.

Community and Workplace Connections

Knowledge and Employability courses provide students with practical and applied opportunities to develop basic reading, writing and mathematical literacy. Community and workplace connections ensure learning within applied contexts and connect the school with environments beyond school, and may include tours to local business and industry, mentorships, job shadowing and work experience.

Knowledge and Employability courses promote the development of career portfolios. Career portfolios help students connect their school experience to the world beyond school. Each portfolio will include exemplars of the student's on- and off-campus experiences and can be used when the student is seeking employment or other post-secondary opportunities. Items appropriate for inclusion in career portfolios are: resumes, samples of written work, awards and/or their representations, teacher and self-evaluation checklists, workplace assessment tools and employer letters of recommendation.

SAFETY

Safety is emphasized and incorporated throughout Knowledge and Employability courses. Courses include basic safety rules and guidelines, and the safe use of tools, equipment and materials in school, home, community and workplace settings.

TECHNOLOGY

Because technology is best learned within an applied context, Information and Communication Technology (ICT), and the use of computers and other technologies are included in Knowledge and Employability courses to help students make the transition to the world beyond school.

ESSENTIAL UNIVERSAL SKILLS AND STRATEGIES

Knowledge and Employability courses emphasize universal skills and strategies that are essential to all students, including the following.

- Interpersonal skills to promote teamwork and respect for, support of and cooperation with others.
- Critical thinking to promote the analysis and appropriate applications of information.
- Creative thinking to promote identification of unique connections among ideas and insightful approaches to questions and issues.
- Decision making to promote making timely and appropriate decisions.
- Problem solving to promote the ability to identify or pose problems, and apply learning to consider the causes, dimensions of and solutions to problems.
- Metacognition² is thinking about thinking and enables students to become more aware of their own thinking and learning processes, and gain greater control of these processes.

RELATIONSHIP TO OTHER COURSES

To enable students, as appropriate, to progress to other Knowledge and Employability course(s) and/or other secondary courses, each Knowledge and Employability course is consistent with the rationale, philosophy, program foundations and organization of other secondary courses.

ENROLLMENT IN KNOWLEDGE AND EMPLOYABILITY COURSES

Students may take one or more courses in the sequence at any time during grades 8 through 12. Students may be enrolled in all courses, or a combination of Knowledge and Employability and other courses.

For information about identifying students for enrollment in one or more courses, see *Knowledge and Employability Courses Policy* and the *Information Manual for Knowledge and Employability Courses*.

RATIONALE AND PHILOSOPHY OF KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

Knowledge and Employability Mathematics focuses on developing essential mathematics knowledge, skills and attitudes in mathematics needed for everyday living at home, in the workplace and in the community.

Knowledge and Employability Mathematics courses are designed for students whose needs, interests and abilities are best served through basic mathematical literacy. Emphasis is on the acquisition of practical life skills and proficiency in using mathematics to solve everyday problems, accommodate change, interpret information and create new knowledge within the contexts of the home, the workplace and the community.

Mathematics competencies are developed through a problem-solving, experiential approach, using problems and activities that directly relate to students' current and future experiences. A variety of everyday activities and problems, along with community partnerships, help students understand and appreciate the role of mathematics in our society. Knowledge and Employability Mathematics courses begin at the student's level of understanding. The use of manipulatives and other strategies/tools assists in addressing the diversity of learning styles and developmental stages of individual students.

Knowledge and Employability Mathematics courses emphasize career/life skills, teamwork, communication skills and thinking processes. Information and Communication Technology (ICT) outcomes, the use of calculators,

2. *Metacognition: Learning-to-learn strategies; awareness of processes and strategies one uses when learning.*

computers and other technologies are integrated into the courses to help students solve problems, and connect with the world beyond school.

Knowledge and Employability Mathematics courses derived from *The Common Curriculum Framework for K–12 Mathematics: Western Canadian Protocol for Collaboration in Basic Education* (1995) and *The Common Curriculum Framework for K–12. Mathematics Grade 10 to Grade 12: Western Canadian Protocol for Collaboration in Basic Education* (1996). Outcomes have been created and/or modified as needed.

These courses make reference to the standards set out by the National Council of Teachers of Mathematics (NCTM).

GOALS OF KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

The goals for students include developing the following mathematics competencies in the context of solving everyday problems:

- identify the problem, and select and apply appropriate problem-solving strategies, mathematical operations and tools
- estimate and calculate solutions accurately
- evaluate the process, result and personal/group performance
- develop teamwork skills and use appropriate vocabulary to reason and communicate mathematically
- apply mathematical literacy to everyday life/work situations.

COMPONENTS OF KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

Mathematics has similarities with, and linkages to, other mathematics courses. However, Knowledge and Employability courses and resources are distinctive in that they:

- provide students with practical and applied opportunities to develop mathematical competencies

- promote the integration of curriculum and community partnerships to connect mathematics to other school subjects and to other environments.

Students will solve everyday problems to achieve the outcomes in this program of studies. Outcomes are organized into the four STRANDS of Mathematics:

1. Number
2. Patterns and Relations
3. Shape and Space
4. Statistics and Probability.

CONCEPTUAL FRAMEWORK FOR K–12 MATHEMATICS

Mathematics includes developing mathematical processes in the context of the nature of mathematics to assist students in achieving the goals of mathematics education and to encourage lifelong learning in mathematics.

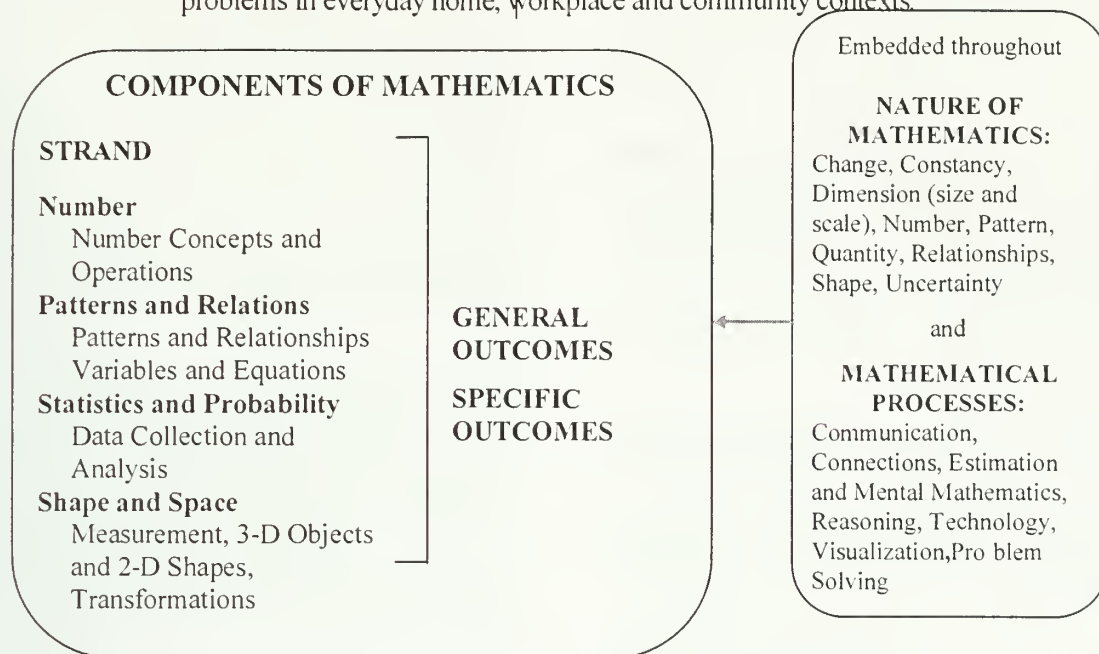
The conceptual framework outlined in this section:

- summarizes the philosophical view toward mathematics and mathematics education
- presents a multifaceted view of mathematics
- presents the discipline as a set of interwoven skills, procedures and concepts.

The following graphic illustrates how student outcomes in mathematics are organized by strand and are influenced by mathematical processes and the nature of mathematics.

KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

Students use a **PROBLEM SOLVING APPROACH** to complete calculations and solve word problems in everyday home, workplace and community contexts.



NATURE OF MATHEMATICS

Knowledge and Employability Mathematics courses focus on making connections between components of the nature of mathematics and everyday home, workplace and community applications. The nature of mathematics includes the following components:

<i>Change</i>	<i>Quantity</i>
<i>Constancy</i>	<i>Relationships</i>
<i>Dimension</i>	<i>Shape</i>
<i>Number</i>	<i>Uncertainty</i>
<i>Pattern</i>	

Change

To make predictions, students need to describe and quantify their observations, attempt to build patterns, and identify those quantities that remain fixed and those quantities that change.

Constancy

The most important properties in mathematics and science relate to those properties that do not change when outside conditions change.

Stability, conservation, equilibrium, steady state and symmetry are terms used to describe constancy.

Students need to be aware of the properties that remain constant so that they can solve problems involving constants such as rates of change, lines with constant slope, direct variation situations, or the angle sums of triangles.

Dimension (size and scale)

The concept of dimension is generally associated with 3-D objects, 2-D shapes or 1-D lines, and needs to be developed within an environment of physical objects.

Physical objects will be described using measurement concepts and pattern recognition, rather than memorization of formulas.

Number

Number, number systems and the operations on numbers are vital to all mathematics learning. The use of number must go beyond procedure

and accuracy to include what is called number sense. Number sense includes:

- an intuitive feeling about numbers and their multiple relationships
- construction of the meaning of number through a variety of experiences
- development of an appreciation of the need for numbers beyond whole numbers
- an appreciation and ability to make quick and accurate estimations for computation and measurement
- the ability to detect arithmetic errors
- knowledge of place value and the effects of arithmetic operations.

Many numerical calculations can be performed with technologies such as calculators and computers, and students must be able to determine if the desired calculations have been done correctly.

Number sense includes recognition of number patterns that can be used to count, make predictions, describe shapes and compare.

Pattern

Patterns exist in number, geometry, algebra and data. By helping students recognize, extend, create and use patterns as a routine aspect of their lives, mathematics will become a useful tool to assist them in their systematic and intellectual understanding of their environment.

Quantity

In everyday situations, people classify, measure and order things. To this end, some of the outcomes are about single numbers, numbers attached to units of measure, and ordered sets of numbers. Other outcomes are about the interpretation of numbers and of number systems.

With the growing use of technology to process numerical information, it is essential for students to have a wide range of estimation skills so that they can evaluate whether or not the numerical output provided by a calculator or a computer is a reasonable solution to a given problem.

Relationships

The study of mathematics is the development of relationships between and among things. For students in Knowledge and Employability courses, mathematics should prepare the way for them to make relationships between mathematics in school and everyday applications. Students should look for relationships among physical things, as well as the data used to describe those things. Relationships will be described visually, symbolically, orally and in written form.

Shape

Shape in mathematics is central to geometry but also includes geometric representations of algebraic relations, the geometry of maps and the creation of networks of plane figures that can be used to construct 3-D objects. It is very important for students to look for and use similarities, congruences, patterns, transformations, dilatations and tessellations in the solution of a range of everyday problems.

The use of language to describe shapes is an important aspect of mathematics. This description allows for the classification of objects according to various attributes, and the naming and analysis of objects. Technology can be used to analyze and depict shape.

Uncertainty

Uncertainty involves data, chance, measurements and errors. Problems dealing with data, together with numbers in context found in the mass media, can be solved within the school mathematics program so long as the data provided and the problems posed have some meaning and relevance to students.

Chance deals with the predictable and the unpredictable outcomes of events. Students from an early age are expected to deal with the concept of chance. As they mature, the language they use to describe chance becomes more sophisticated and involves the vocabulary of probability theory.

MATHEMATICAL PROCESSES

Students encounter the critical components of mathematics process in order to achieve the goals of mathematics education and to encourage lifelong learning in mathematics. Students in Knowledge and Employability Mathematics courses will build on and apply mathematical processes using everyday home, workplace and community problems.

This program of studies incorporates the following seven interrelated mathematical processes that are intended to permeate teaching and learning.

Communication [C] – communicate using appropriate mathematical vocabulary

Connections [CN] – connect mathematical ideas to other concepts in mathematics, to everyday experiences and to other subjects

Estimation and Mental Mathematics [E] – use estimation and mental mathematics, where appropriate

Problem Solving [PS] – relate and apply new mathematical knowledge through problem solving

Reasoning [R] – reason and justify thinking and solutions

Technology [T] – select and use appropriate technologies as tools to solve problems

Visualization [V] – use visualization to assist in processing information, making connections and solving problems.

Communication

Students need to communicate mathematical ideas clearly and effectively, orally and in writing.

Communication will help students make connections among different representations of mathematical ideas including verbal, physical, graphic, pictorial, symbolic and mental representations.

Connections

Students need numerous and varied experiences in order to appreciate the usefulness of mathematics. Students will explore connections within mathematics, from

mathematics to other subjects, and from mathematics to their daily experiences. When mathematical ideas are connected to each other through concrete, pictorial and symbolic representations, students begin to view mathematics as an integrated whole.

Reasoning

Students need to develop confidence in their ability to reason and to justify their thinking within and outside of mathematics. The power of reasoning helps students to make sense of mathematics, to be logical in their thinking and to convince others.

Inductive reasoning helps students explore and make conjectures from activities that allow generalizations from a pattern of observations.

Deductive reasoning helps students test conjectures and build arguments that serve to validate thinking. Deductive reasoning builds a structured body of knowledge.

Technology

Technology, such as calculators and computers can be used as tools for a variety of purposes including to organize and display data, perform calculations and reinforce the learning of mathematical concepts.

Visualization

Analyzing and interpreting a visual summary aids in understanding and making predictions from everyday information and data.

The use of images in the study of mathematics provides students with the opportunity to understand mathematical concepts and to make connections among them.

Problem Solving

Students develop a true understanding of mathematical concepts and procedures when they solve problems in meaningful contexts. Through problem solving the strands of Knowledge and Employability Mathematics are developed.

Problem solving also provides opportunities for students to be active in constructing

mathematical meaning, learn problem-solving strategies, practise a variety of concepts and skills, and communicate mathematical ideas.

Problem-solving situations in Knowledge and Employability Mathematics should come from the everyday experiences of the student. Students will attach mathematical meaning to familiar activities.

Students will **determine** which mathematical operation(s) can be used to solve everyday problems, and will then solve problems, using technology as appropriate.

Students will **apply** mathematical vocabulary, skills and strategies to work with others, as members of a team or independently, as appropriate, to solve problems and complete tasks.

Students will **communicate** mathematics processes, strategies and solutions in written and verbal form.

Students will **investigate** the roles of mathematics and technology in a variety of career/workplace situations.

PROBLEM-SOLVING FRAMEWORK FOR KNOWLEDGE AND EMPLOYABILITY MATHEMATICS

Understand the Problem

- ask questions
- sort and classify information
- look for patterns
- interpret pictures, charts, tables and graphs
- identify key words
- simplify questions
- identify important and unimportant information

Look Back

- check solutions for reasonableness and accuracy using strategies such as opposite operations, estimation, pencil and paper, a calculator, a computer
- evaluate choices and the process in problem solving, then redefine the action plan as appropriate
- examine the application of a concept/strategy in other subject areas, the home or the workplace
- evaluate the appropriateness of technology and other tools used to investigate and solve the problem

Teamwork

- work independently or as a member of a group
- demonstrate teamwork skills such as listening, accepting the ideas of others, evaluating personal performance and analyzing group interactions

Think of a Plan

- develop an action plan
- identify the appropriate materials and tools for implementing the action plan
- draw a picture, use symbols or manipulatives
- predict/estimate solutions to the problem

Carry Out the Plan

- use data gathered from a variety of electronic and other sources to solve the problem
- solve the problem using pencil and paper, manipulatives, symbols, a calculator, a computer or other tool/strategy
- state solutions to the problem in a conclusion sentence
- describe and/or demonstrate solutions, e.g., in a journal or computer presentation, using manipulatives or symbols
- apply communication strategies such as sharing ideas clearly, using appropriate listening and representing skills

Strand: Number (Number Concepts and Number Operations)*Students will:*

- estimate and solve problems with numbers in everyday home, workplace and community contexts, using technology as appropriate
- develop and demonstrate number sense to describe quantities and represent numbers in multiple ways, and apply appropriate arithmetic operations
- assess the reasonableness of calculations and problem-solving strategies
- communicate mathematically and investigate the application of number concepts and operations in a variety of career and workplace situations, working individually or as a member of a team.

C Communication
 CN Connections
 E Estimation and
 Mental Mathematics
 PS Problem Solving
 R Reasoning
 T Technology
 V Visualization

Grade 8	Grade 9
General Outcome Demonstrate a number sense for whole numbers, common fractions, decimals and percents; and apply arithmetic operations to solve problems with whole numbers, fractions, decimals and percents in everyday contexts.	General Outcome Demonstrate a number sense for whole numbers, common fractions, mixed numbers, decimals, percents and ratios; and explore integers and apply arithmetic operations to solve problems in everyday contexts.
Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 1. read and write numerals and number words to 1 000 000 [C, CN, V] 2. estimate quantities up to 100 000 [E] 3. compare and order whole numbers [C, R, V] 4. identify, model, describe and demonstrate common multiples, common factors, least common multiples, greatest common factors and prime factorizations using numbers to 100 [C, PS, R, V] 5. estimate solutions and solve problems with whole numbers in everyday contexts [CN, PS] 6. demonstrate concretely, pictorially and symbolically an understanding of place value from hundredths [C, R, V] 7. demonstrate and describe common proper, improper, and equivalent fractions and mixed numbers concretely, pictorially and symbolically [C, R, V] 8. compare and order proper fractions and decimals to hundredths [C, R, V] 9. add, subtract, multiply and divide decimals to hundredths to solve problems in everyday contexts [PS, T, V] 	Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 1. read and write numerals greater than a million [C, CN] 2. estimate quantities up to a million [E] 3. determine the lowest common multiple for pairs of numbers less than 10 [PS, R, T] 4. determine the greatest common factor for pairs of numbers less than 25 [PS, R, T] 5. add, subtract, multiply and divide proper fractions and mixed numbers to solve problems in everyday contexts [PS, T] 6. convert fractions into decimal equivalents as appropriate to solve problems [PS, V] 7. round numbers to nearest unit, tenth and hundredth as appropriate to estimate and calculate solutions to problems in everyday contexts [E, R] 8. write a whole number as: <ul style="list-style-type: none"> • an expanded numeral, using powers of 10 • scientific notation [C, CN, V] 9. estimate and calculate averages (mean) in relation to everyday situations including average monthly income over six months, and average weekly entertainment expenses over one month [C, E, R, V]

Grade 8	Grade 9
<p>Specific Outcomes (continued)</p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> 10. demonstrate and describe percentage concretely, pictorially and symbolically [C, CN, R, V] 11. estimate and calculate percents to solve problems in everyday contexts [C, E, R, T] 12. estimate and add, subtract, multiply and divide proper fractions with like denominators to solve everyday problems [CN, E, PS, T] 13. convert among fractions, decimals and percents to facilitate solving problems. [CN, PS] 	<p>Specific Outcomes (continued)</p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> 10. estimate and apply arithmetic operations with whole numbers and decimals using appropriate technology to solve everyday problems (2-digit whole-number multipliers and dividers) [E, R, PS, T] 11. demonstrate and explain the meaning of ratios concretely, pictorially and symbolically [C, CN, R, V] 12. use rates and unit costs to estimate, calculate and compare prices [C, E, R] 13. identify common uses of positive and negative numbers, including above/below sea level and temperatures [C, CN, V] 14. compare and order positive and negative numbers using appropriate tools such as a number line or a thermometer. [R, V]

Strand: Patterns and Relations (Patterns and Relationships)*Students will:*

- recognize that patterns and relationships exist in nature and everyday living
- use patterns and relationships to develop a better understanding of their environments and to solve everyday problems at home, in the workplace and in the community, using technology as appropriate
- assess the reasonableness of calculations and problem-solving strategies
- communicate mathematically and investigate the application of patterns and relationships in a variety of career and workplace situations, working individually or as a member of a team.

C Communication
CN Connections
E Estimation and
 Mental Mathematics
PS Problem Solving
R Reasoning
T Technology
V Visualization

Grade 8	Grade 9
General Outcome Construct, extend and summarize patterns including those found in nature, and within students' environments, using rules, charts, mental mathematics, calculators and other strategies/tools.	General Outcome Use relationships to summarize, generalize and extend patterns to understand the environment and solve everyday problems.
Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 1. identify and describe patterns and relationships in nature and everyday living using everyday language in spoken and written form [C, CN, R, V] 2. demonstrate a rule for a pattern and make predictions using the rule [C, R, V] 3. describe how a pattern is extended using everyday language in spoken and written form [C, CN] 4. identify number values from a given graph. [E, PS, V] 	Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 1. summarize a relationship using everyday language in oral and written form [C, CN, R] 2. make predictions based on everyday living patterns and use patterns to draw conclusions [CN, E] 3. create expressions and rules to describe, complete and extend patterns and relationships [C, CN, PS, R] 4. read and graph relationships and draw conclusions in everyday contexts. [R, V]

Strand: Patterns and Relations (Variables and Equations)*Students will:*

- represent algebraic equations in multiple ways to solve everyday problems, using technology as appropriate
- communicate mathematically and investigate the application of variables and equations in a variety of career and workplace situations, working individually or as a member of a team.

C Communication
CN Connections
E Estimation and
Mental Mathematics
PS Problem Solving
R Reasoning
T Technology
V Visualization

Grade 8	Grade 9
General Outcome Use informal and concrete representations of equality and operations to solve problems in everyday contexts.	General Outcome Use informal and concrete representations of equality and operations to solve problems in everyday contexts.
Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none">5. demonstrate and explain the meaning of preservation of equality by balancing or using models and diagrams [C, CN, PS, R, V]6. use pre-algebra strategies to solve equations with one unknown and with whole numbers. [PS, R]	Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none">5. interpret formulas related to practical situations and solve everyday problems using common arithmetic expressions and relationships, such as formulas for perimeter and area. [CN, PS, R, V]

Strand: Shape and Space (Measurement)*Students will:*

- estimate and take accurate measurements using everyday metric (SI) and Imperial units of measurement and solve problems using appropriate measuring devices, strategies and technology in home, workplace and community contexts
- communicate mathematically and investigate the application of measurement knowledge and skills in a variety of career and workplace situations, working individually or as a member of a team
- assess reasonableness of calculations and problem-solving strategies.

C Communication
 CN Connections
 E Estimation and
 Mental Mathematics
 PS Problem Solving
 R Reasoning
 T Technology
 V Visualization

Grade 8	Grade 9
General Outcome Use measurement concepts, appropriate tools and results of measurements to solve problems in everyday contexts.	General Outcome Solve problems in everyday contexts involving perimeter, area, surface area, mass (weight), capacity (volume) and angle measurements.
Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 1. recognize and explain the meaning of length, width, height, depth, thickness, perimeter and circumference [C, CN, R] 2. use everyday tools and commonly used SI units to take accurate linear measurements (millimetre, centimetre, metre, kilometre) [E, PS] 3. use everyday tools and commonly used Imperial units to take accurate linear measurements, (inches, feet, yards, miles) [E, PS] 4. estimate, measure and calculate the perimeter of quadrilaterals and triangles [CN, E] 5. estimate and measure the effect of changing one or more dimensions of a rectangle on its perimeter and area [E, R] 6. estimate and measure the perimeter and area of irregular shapes by dividing them into parts (area) using manipulatives and diagrams [CN, R] 7. demonstrate the relationships among circumference, radius and diameter of circles [CN, R, V] 8. use concrete objects to relate cm^3 to mL [CN, R, V] 9. solve problems involving mass (weight) using g, kg and t [PS] 	Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 1. use common SI units and tools to take accurate measurements of length, mass (weight) and capacity (volume) [CN, PS, R] 2. use conversion charts, calculators and/or other tools to compare and convert among commonly used SI units to solve problems [CN] 3. use common Imperial units and tools to take accurate measurements of length, mass (weight), and capacity (volume) [CN, PS, R] 4. use conversion charts, calculators and/or other tools to compare and convert among commonly used Imperial units to solve problems [CN] 5. design and construct rectangles, given one or both of perimeter and area, using a variety of tools such as graph paper [PS, R] 6. develop, verify and apply rules or expressions for the perimeter of polygons [CN, PS, R] 7. develop, verify and apply rules of expressions for the area of rectangles (mm^2, cm^2, m^2, ha^2 and km^2) [CN, PS, R] 8. demonstrate concretely, pictorially and symbolically that many rectangles are possible for a given perimeter or area [CN, R] 9. illustrate the concept of surface area of 3-D objects [CN, R, V]

Grade 8	Grade 9
<p>Specific Outcomes (continued)</p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> 10. identify the relationships among seconds, minutes, hours, days, weeks, months and years, centuries and millennium, using a variety of tools such as calendars and technology [CN] 11. read and write time on 12-hour and 24-hour clocks, using digital and analog timepieces [CN, E] 12. convert between hours and minutes, and between minutes and seconds as required in everyday contexts [CN, R] 13. add and subtract hours and minutes in appropriate everyday applications [CN, T] 14. read and write SI notation for recording date and time. [C] 	<p>Specific Outcomes (continued)</p> <p><i>Students will:</i></p> <ol style="list-style-type: none"> 10. determine the volume of an object by measuring the displacement of a liquid by that object (cm^3, mL) [CN, PS, V] 11. estimate and solve problems involving mass (weight) and capacity (volume) using everyday metric and Imperial units [PS, R] 12. identify and discuss examples of angles in the environment and classify angles, using right, acute, obtuse, straight or reflex terminology [C, CN, R, V] 13. estimate, measure and draw angles up to 180°, using a circular protractor and other tools. [CN, E]

Strand: Shape and Space (3-D Objects and 2-D Shapes)*Students will:*

- create, analyze and manipulate 3-D objects and 2-D shapes using technology and other tools as appropriate to better understand shapes and objects at home, in the workplace and community environments
- communicate mathematically and investigate the application of shape and space in a variety of career and workplace situations, working individually or as a member of a team.

C Communication
CN Connections
E Estimation and
 Mental Mathematics
PS Problem Solving
R Reasoning
T Technology
V Visualization

Grade 8	Grade 9
General Outcome Use visualization and symmetry to extend awareness of objects and shapes, and solve problems involving classification and sketching.	General Outcome Use visualization and symmetry to extend awareness of objects and shapes, and solve problems involving classification and sketching.
Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 15. identify, classify, describe and construct models of basic 3-D objects including rectangular prisms, cubes, cylinders, cones and spheres [C, R, T, V] 16. design and construct nets for 3-D objects [CN, V] 17. complete the drawing of a 3-D object on grid paper given the front face [E, V] 18. recognize and identify from everyday observations and experiences: points, lines, parallel lines, intersecting lines, perpendicular lines, vertical lines, horizontal lines and line segments. [CN, V] 	Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 14. sort quadrilaterals and regular polygons according to the number of lines of symmetry [V] 15. classify triangles according to the measurements of their angles, e.g., acute, obtuse, right [C, CN, V] 16. sketch 3-D objects and skeletons with and without grids [PS, T, V] 17. reproduce a given geometric drawing on grid paper [R, V] 18. estimate and demonstrate perimeters and areas of irregular 2-D shapes using grids [PS, V] 19. use scale to reproduce a 2-D shape [R, V] 20. recognize and appreciate optical illusions. [V]

Strand: Shape and Space (Transformations)*Students will:*

- enhance their understanding of objects, shapes and motion to better understand shape and space in their everyday lives
- perform, create and analyze transformations to become more aware of shapes and objects.

C Communication
CN Connections
E Estimation and Mental Mathematics
PS Problem Solving
R Reasoning
T Technology
V Visualization

Grade 8	Grade 9
General Outcome Describe motion in terms of slides, turns or flips and use coordinates to describe and create 2-D objects.	General Outcome Create and analyze patterns and designs that incorporate symmetry, tessellations, translations and reflections.
Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 19. recognize and describe motion as a slide (translation), a turn (rotation), or a flip (reflection) [C, V] 20. identify and describe tessellations found in natural and man-made environments that include regular and irregular shapes [C, CN, T, V] 21. cover a surface using one or more tessellating shapes [PS, T, V] 22. identify and illustrate planes of symmetry on quadrilaterals and triangles [V] 23. recognize and label the quadrants on a grid [V] 24. reproduce a given geometric drawing on grid paper. [CN, V] 	Specific Outcomes <i>Students will:</i> <ol style="list-style-type: none"> 21. create, analyze and describe designs, using translations (slides), reflections (flips) and rotations (turns) [C, T, V] 22. draw and describe designs located in the first and second quadrants of a coordinate grid, using ordered pairs [C, PS, R, V] 23. relate reflections to lines and planes of symmetry. [CN, V]

Strand: Statistics and Probability (Collecting and Analyzing Information)*Students will:*

- collect and/or generate and display data and other information related to home, workplace and community applications, using technology as appropriate
- interpret, analyze and maintain data, charts, graphs and other records for personal and/or workplace use
- apply probability and chance to make predictions when planning and making everyday decisions.

C Communication
CN Connections
E Estimation and
 Mental Mathematics
PS Problem Solving
R Reasoning
T Technology
V Visualization

Grade 8	Grade 9
General Outcome Develop and implement a plan for collecting, displaying, and analyzing information and data gathered from appropriate sources within everyday contexts.	General Outcome Develop and implement a plan for the collection, display and analysis of data and information for everyday applications.
Specific Outcome <i>Students will:</i> <ol style="list-style-type: none"> 1. use a variety of strategies to interpret information from prepared graphs, charts and/or databases such as: <ul style="list-style-type: none"> • read axis and column sub-headings, and text under, beside or above • compare and analyze pictures, bars, lines, symbols or markers • find trends or patterns • re-read to connect information in graphs/charts to surrounding and/or other information [C, E, PS, R] 2. identify patterns and make predictions based on information and data [E, R] 3. identify a question to generate appropriate data/information and predict results [E, R] 4. gather, organize and display information and data using a variety of organizers/methods [C, T, V] 5. discuss the reasonableness of data and results [C, R] 6. make inferences to generate a conclusion about data/information. [E, R] 	Specific Outcome <i>Students will:</i> <ol style="list-style-type: none"> 1. read, interpret and communicate information represented in graphs, charts and other collection tools [C, CN] 2. formulate questions for investigation, given a context [R] 3. select and use appropriate methods of collecting data such as surveys, experiments, observations, electronic networks [C, PS, T] 4. describe how data collected are affected by the nature/size of sample, method of collection and biases [C, CN, R] 5. organize and display data and information by hand and/or using technology in a variety of ways, including tables, charts, bar or line graphs, frequency diagrams and broken-line graphs [C, CN, T, V] 6. describe the general distribution of data using smallest and largest value, frequency, value in the middle and patterns [C, CN, R] 7. analyze sets of data, draw conclusions and make comparisons [C, CN, R] 8. manipulate data as appropriate in everyday applications at home or in the workplace [C, CN, T] 9. draw conclusions/make predictions based on data/information analysis. [R]

REFERENCES

Alberta Education. *The Common Curriculum Framework for K–12 Mathematics: Western Canadian Protocol for Collaboration in Basic Education*. Edmonton, AB: Alberta Education, Learning and Teaching Resources Branch, 1995.

Alberta Learning. *The Alberta Framework of Essential Competencies for Working, Learning and Living*.

Guide to Education: ECS to Grade 12.

<http://www.education.gov.ab.ca/educationguide/default.asp>

Integrated Occupational Program Information Manual for Administrators, Counsellors and Teachers

http://www.education.gov.ab.ca/k_12/curriculum/bySubject/iop/IOPmanual.pdf

Off-campus Education Guide for Administrators, Counsellors and Teachers

http://www.education.gov.ab.ca/k_12/curriculum/offcampus.pdf

Policy, Regulations and Forms Manual

<http://www.education.gov.ab.ca/educationguide/pol-plan/polregs/142.asp>

Registered Apprenticeship Program Information Manual

http://www.education.gov.ab.ca/k_12/curriculum/rapinfoman.pdf

Standards for Educational Assessment (Amended June 2004) by Special Education Branch. Available for purchase at <http://www.lrc.education.gov.ab.ca/pro/resources/item.htm>

